Name, Surname:	P102_Index:
Student ID Number:	Exam Room:

PHYS 102 General Physics II – Final Exam

May 24, 2016 Tuesday 11:45-13:15

Please read!

- Count to make sure that there are 5 pages in the question booklet

- Check your name and surname on front page, and student ID number on each page, and sign each page.
- This examination is conducted with closed books and notes.
- Put all your personal belongings underneath your seat and make sure that pages of books or notebooks are not open.
- Absolutely no talking or exchanging anything (like rulers, erasers) during the exam.
- You must show all your work to get credit; you will not be given any points unless you show the details of your work (this applies even if your final answer is correct!).
- Write neatly and clearly; unreadable answers will not be given any credit.
- If you need more writing space, use the backs of the question pages and put down the appropriate pointer marks.
- Make sure that you include units in your results.
- Make sure that you label the axis and have units in your plots.
- You are not allowed to use calculators during this exam.
- Only the answers in the boxes will be graded and NO partial credit will be given. No points will be given to unjustified answers. Incomplete calculations will not be graded.

Signature:

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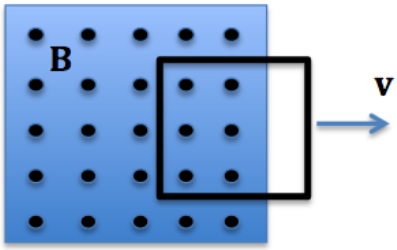
1- (25 pts) A square metal loop of side length **L** is pulled out of a uniform magnetic field with a velocity of $\mathbf{v = A + Ct}$, where **A** and **C** are positive constants and **t** is time. The magnetic field has a strength **B**, and it is directed perpendicular to the surface of the loop. The right side of the square loop is aligned with the edge of the field region when the pulling first starts at $\mathbf{t = 0}$. Plot the induced EMF in the loop as a function of time as it is pulled?



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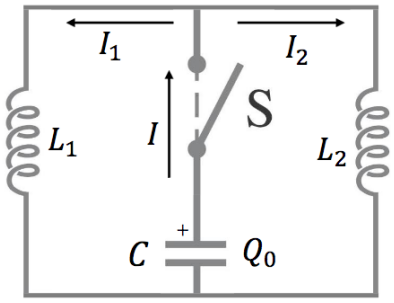
2- (25 pts) Consider the circuit shown in the figure, where the capacitor is initially charged with charge Q_0. After the switch S is closed at time *t = 0*:



a) Find the charge *Q(t)* on the capacitor as a function of time.

Q(t) =

b) Find the current $I_1(t)$ as a function of time.

$I_1(t)$ =

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3- (25 pts) A generator with rms voltage of ε_{rms} = 120 V drives an RLC circuit at frequency

f = 60 Hz. The load resistance R and reactance values of the inductor L and the capacitor C of the circuit are given by R = 50 Ω, X_L = 50 Ω, X_C = 150 Ω, respectively.

(i) What is the impedance of the circuit?

(ii) What is the peak current amplitude in the circuit?

(iii) What is the phase angle Φ of the circuit?

(iv) The current leads the voltage in the circuit. (TRUE / FALSE)

(v) The circuit is capacitive. (TRUE / FALSE)

(vi) What is the average power delivered by the generator?

(vii) What is the average power dissipated at the load resistor?

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4- (25 pts) A sinusoidal propagating electromagnetic wave has a wavelength of 15 cm. At particular instant, the electric and magnetic fields orientations are given as E= -E0k, B= B0j.

a) What is the frequency of the electromagnetic wave?

f =

b) What is the propagation direction of the wave?

c) What is the wave function describing the electric field of the wave? Assume that E0 is the amplitude of the electric field.

E_1 =

d) Write the similar wave function of the same electromagnetic wave propagating in opposite direction (reflected wave).

E_2 =

e) If incident (E_1) and reflected (E_2) waves form a standing wave write the wave function describing electric field.

E_s =

f) What is the minimum distance between two points where the total electric field of the standing wave is always zero Es=0. (the distance between nodal planes of E)